

Original Research Article

A Clinicopathological study of subdural membranes

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Abstract

Background: One of the most common neurosurgical entities is chronic subdural hematoma and its characteristic presence of enveloping subdural membranes. The membrane study acts as a rough guide to estimate the time since injury, the nature of the entity and the associated clinical condition.

Aim and objectives: To study the demographics, incidence, symptomatology, neurological status, histopathology, risk factors, diagnosis, treatment and outcome of the patients presenting with subdural membranes.

Materials and methods: The study was conducted in the Department of Neurosurgery, Government General Hospital (GGH), Kakinada (referral teaching hospital of Rangaraya Medical College). The study population comprised of all patients from both sexes who were diagnosed to have subdural collections with membranes that presented in GGH during the study period. Patients who met inclusion criteria had their independent variables ascertained were included in the study. The study was designed as prospective study. Neurological status, symptomatology, histopathology and Postoperative outcome were assessed immediately after surgery in the ward, and then two weeks and one month afterwards in the OPD. Relevant investigations were done as patient's condition dictated.

Results: A total of 19 patients were included in the study for the final analysis. All the patients presenting with the diagnosis of Chronic Subdural Hematoma, or diagnosed after screening for symptoms suggestive of subdural collections were included in the study. CT/ MRI scan was used for diagnosis and preoperative evaluation of the patients. After procedure the specimen was sent for pathological evaluation. All the patients were thoroughly examined clinically and findings noted. The Pathological reports according to Nagahori, et al was followed and was noted. Surgical management was offered for all the patients. All the patients were evaluated preoperatively for any co-morbidity

and managed accordingly, to be fit for surgical procedure. Adequate blood was reserved. Patient and attendants were explained in detail about the nature history of the disease, the prognosis and the need for surgery with its associated complications. Informed consent was obtained for surgery. Post operatively, antibiotics were given and patients observed for any CSF leaks, wound infection or meningitis. Patients were discharged after 7-9 days post-operatively. Neurological status was assessed at discharge and follow up. It was noted that most common age group affected was between 61-70 years, males were more commonly affected than females. Most common risk factors were hypertension 47.38% followed by diabetes 21.05%. Most commonly associated risk factor noted in the present study was both alcoholism with smoking. Most common presenting symptom was hemiparesis 52.6% followed by headache 29.41%. Most common type of membrane in our study was Type III 68.38% followed by Type II 15.58%. Most common type of membrane in our study was Type III 68.38% followed by Type II 15.58%. Most common type of lesion encountered in our study was chronic followed by acute on chronic. Most lesions were observed on the right side. Most common site of lesion was fronto-parietal followed by fronto-temporoparietal in location. Associated lesions were seen in 57.86% of cases. Generally outcome based on (GCS) preoperative and postoperative scores were good in about 78.90%. Generally outcome based on (GCS) preoperative and postoperative scores were good in about 78.90%.

Conclusion: This study underlines that craniotomy and subtotal membranectomy is still an acceptable, safe, efficient and even a better procedure for patients presenting with subdural membranes.

Key words

Clinicopathology, Subdural membrane, SDH.

Introduction

One of the most common neurosurgical entities is chronic subdural hematoma and its characteristic presence of enveloping subdural membranes. The membrane study acts as a rough guide to estimate the time since injury, the nature of the entity and the associated clinical condition. Occasionally, subdural membranes may show various entities, such as infectious origin, malignancies, calcifications, etc. Sometimes they present as a subdural empyema, subdural hygroma or an organized hematoma [2, 3] organised hematoma with thick membrane formation (OHTMF) is one of them and has to be treated appropriately. Usual burr hole craniostomy is not sufficient to remove the membrane. If not adequately removed, it can cause early recurrence and will create further complications; Recurrence rate of CSDH after surgery is about 5% to 25%. Thick membrane formation is found in about 5-6% of cases. Possibility of recurrence is high because of both underlying pathology and inappropriate surgical

treatment. Therefore in the present study we analyse the symptomatic presentations, neurological grading, imaging findings, histopathology of the membranes and the surgical outcome.

Aim

- To study the demographics, incidence, symptomatology, neurological status, histopathology, risk factors, diagnosis, treatment and outcome of the patients presenting with subdural membranes.

Materials and methods

The study was conducted in the Department of Neurosurgery, Government General Hospital (GGH), Kakinada (referral teaching hospital of Rangaraya Medical College). A synopsis regarding the present study was submitted to the Institutional Ethics Committee and the permission was taken before starting the study.

Study Population

The study population comprised of all patients from both sexes who were diagnosed to have subdural collections with membranes that presented in GGH during the study period. Patients who met inclusion criteria had their independent variables ascertained were included in the study. A total of 19 patients were included in the study for the final analysis.

Study Design

The study was designed as prospective study. Neurological status, symptomatology, histopathology and Post-operative outcome were assessed immediately after surgery in the ward, and then two weeks and one month afterwards in the OPD. Relevant investigations were done as patient's condition dictated.

Inclusion criteria

- Patients with subdural collections/membranes as per their clinical presentation.
- Patients of either sex.
- Patients of any age.
- Patients who were admitted and underwent surgical management at Department of Neurosurgery, Government General Hospital, Kakinada
- Patients who were willing to give consent.

Exclusion criteria

- A Patient who did not give informed Consent to take part in the study.
- Patients with inadequate records.
- Re-surgery.
- Patients who were managed conservatively.

Operational procedure of the study

All the patients presenting with the diagnosis of Chronic Subdural Hematoma, or diagnosed after screening for symptoms suggestive of subdural collections were included in the study. CT/ MRI scan was used for diagnosis and preoperative evaluation of the patients. After procedure the specimen was sent for pathological evaluation.

All the patients were thoroughly examined clinically and findings noted. The pathological reports according to Nagahori, et al. [1] was followed. All the patients were thoroughly examined clinically and findings noted. Nagahori, et al. [1] histological nature of outer membrane of chronic subdural hematoma.

Grade Findings

I - This membrane containing immature fibroblasts and collagen fibres was associated with very slight or sparse cell infiltration and neocapillaries.

II - Membrane consists of one layer of immature connective tissue with marked cell infiltration and vascularization throughout the entire thickness.

III - This type had a structure of 2 or 3 layers and was associated with capillaries with large lumen on the side of the dura mater and marked cell infiltration and many thin new vessels on the side of hematoma cavity. Sometimes a layer consisting of only collagen fibres and fibroblasts between two such layers was seen. In addition, haemorrhage into the membrane was often observed.

IV - This type showed inflammatory cell infiltration, neovascularization and hemorrhage in the outer membrane of cicatricial tissue.

Surgical management was offered for all the patients. All the patients were evaluated preoperatively for any co-morbidity and managed accordingly, to be fit for surgical procedure. Adequate blood was reserved. Patient and attendants were explained in detail about the nature history of the disease, the prognosis and the need for surgery with its associated complications. Informed consent was obtained for surgery. All the patients were operated under general anaesthesia and in supine position head turned to the opposite side at 45 degrees. No intraoperative neurophysiological monitoring was used. A craniotomy was performed for all the lesions diameter of the bone flap was according to the involvement of the entity larger craniotomies were done for patients with

septated subdural collections. Dural membranes were subjected to histopathological examination.

Post operatively, antibiotics were given and patients observed for any CSF leaks, wound infection or meningitis. Patients were discharged after 7-9 days postoperatively.

Neurological status

Post operatively, antibiotics were given and patients observed for any CSF leaks, wound infection or meningitis. Patients were discharged after 7-9 days postoperatively. Neurological status was assessed at discharge and follow up.

Results

Most common age group affected was between 61-70 years, males are more commonly affected than females alcoholism and smoking are important risk factors (**Table – 1**).

Table – 1: Age, sex and risk factors.

Age	
<50	6
>50	13
Gender	
Male	16
Female	3
Risk factors	
Alcoholism	15
Smoking	13

Most common presenting symptom was hemiparesis 52.6% followed by headache 29.41% (**Table – 2**). Histopathology was as per **Table – 3**. Outcome was as per **Table – 4**.

Table – 2: showing symptoms

	Cases	%
Hemiparesis	13	68.4%
Headache	11	57.85%
Altered sensorium	10	51.63%
Speech difficulty	6	31.57%
Fever	4	19.95%
Others (Gait difficulty, vision difficulty, Facial palsies)	4	19.95%

Discussion

Untreated chronic SDH leads to death in most instances, either by hematoma induced cerebral decompensation or as a result of concomitant infections, such as pneumonia, and worsening of the patient's general condition. Spontaneous resolution of the subdural collection is rare and untreated patients, who survive, mostly children, may present with calcifications or ossifications, sometimes the histopathological diagnosis is very crucial as it may show rarer entities like calcifications, malignancies, infections like actinomycosis, etc.

Table – 3: Histopathology.

	Cases	Percentage
Type 1	1	5.1%
Type 11	3	15.76%
Type III	11	57.89%
Type IV	4	19.98%

Table – 4: Outcome.

	Cases	Percentage
Good	13	68.11%
Recurrence	3	15.96%
Expired	3	15.96%

Out of 119 cases diagnosed to have subdural collections 36 were diagnosed as chronic subdural hematoma, one was diagnosed to have subdural hygroma, finally 19 cases of chronic subdural collections were evaluated on the basis of their clinical, radiological and histopathological features during the duration of study.

In the present study, there were 15 males and 4 females i.e. 78% males and 22% females. Male preponderance among cases was as high as 3.75:1 which is in accordance with bokka, et al. [4] which has a male: female ratio of 3.33:1.

This may be due to more exposure of the male population to injuries than females and females are seeking less of medical advice.

The most common age of presentation was between 61-70 years (42%). The youngest case presented was a 17 years male patient suffering with bleeding diathesis (Hemophilia A), the oldest case presented was at the age of 76 years, indicating the presence of this entity more commonly in the older age groups.

In our study, most common symptom at presentation was hemiparesis which was observed in 52.6%, history of trauma was seen in 47.38%, altered level of consciousness in 26.3%, headache in 31.56%, speech difficulty in 15.78%, bowel and bladder disturbances in 10.52% and fever was observed in 10.52%, left facial nerve palsy was noted in two patients i.e. 10.52%, difficulty in walking, difficulty in swallowing were noted in 5.8%, one patient had defective vision in post-operative period who was subjected to re-surgery the patient was suffering with haemophilia A. As per Bokka, et al. [4], most common symptom at presentation was headache which was observed in 66.67%, altered level of consciousness in 28.84%, vomiting in 25%, vertigo and giddiness in 8.33%, blurring of vision in 1.92%, urinary and fecal incontinence in 13.46%, hemiparesis in 26.91%, paraparesis and quadriparesis in 1.92% each, papilledema in 5.76%, 3rd and 6th nerve palsy in 1.92% each and 7th nerve palsy in 3.84%. As per Potdar, et al. [5], headache was noted in 63%, vomiting in 25%, vertigo in 8.7%, blurring of vision in 1%, gait disturbances in 57%, limb weakness 54% which is nearly in accordance to our study which is 52.6%. Slurring of speech was noted in 8.2% as per Potdar, et al. [5] which is in contradiction to our study which is 15.78%. Altered sensorium was noted in our study as 26.3% which is in accordance to Potdar, et al. [5] which is 28%, urinary continence noted in 13% our study showing 10.52%.

As far as CT/MRI findings are concerned, MRI is more valuable since it gives more in detail than CT. Contrast enhancement gives more detail about any loculations, thick membranes. As per Gandhoke, et al. [6] The thickness of hematomas on CT scans was grouped as <2 cm (n = 54,

35%), 2–3 cm (n = 63, 40%) and >3 cm (n = 39, 25%). When thickness was compared to type of neomembrane, CSH with a type IV membrane were significantly thicker (p < 0.001,) than types II and III. Mid line shift was present in (54%) but was not significantly associated with type of neomembrane (p = 0.078). Our series showed midline shift in almost all the cases which is in contradiction to the Gandhoke, et al. [6]. As per Potdar, et al. [5] bilateral disease was most commonly in elder age group and older age groups. Younger age group presented with iso density on CT scan, older age group presented with mixed density with multiple layering on CT scans. Maximum thickness was observed in older age groups. In the present series about 60% of the cases showed mixed density/intensity on the scans and bilateral disease was observed in 21.05%. As per Bokka, et al. [4], most common site of chronic SDH was frontotemporoparietal region (58.34%), next most common site being frontoparietal (13.46%). About 87.18% of cases had unilateral while 12.82% of cases had bilateral hematoma. Hematoma is slightly more common on the right side when compared to the left side.

In our study most common presentation was as chronic (42.08%), acute on chronic (36.82%), subacute (21.05%). collection most commonly on to the right side when compared to left side which is in contradiction to Bokka, et al. [4] Maximum thickness was seen in the older age groups which is in accordance to Potdar, et al. [5]. Associated lesions were noted in 57.86% most commonly as infarcts followed by contusions and dilatation of ventricles.

In 1993 Nagahori, et al. [1] studied the outer neomembrane of 43 patients between the age of 16–84 years who had CSDH. 7% were type I, 48% were type II, 32% were type III, and 23% were type IV neomembranes. As per Bokka, et al. [4], the most common histopathological type of membrane observed was the inflammatory membrane (Type II) seen in 42.30% of cases followed by hemorrhagic inflammatory membrane (Type III) seen in 34.62% of cases

while scar inflammatory type of membrane (Type IV) was seen in 23.08% of cases. No case with non-inflammatory type (Type I) was encountered. According to Potdar, et al. [5] type IV membrane was seen in 43% cases, type III in 31% cases, type II in 24% of the cases, no cases were seen in type I, in our study the most common histopathological type was type III (68.38%), followed by type II (15.58%), type I (10.52%) and type IV (5.26%) which is in contradiction to the above studies.

As per Gandhoke, et al. [6] Histopathological analysis revealed 66 cases (42%) of type II, 54 cases (35%) of type III, and 36 cases (23%) of type IV neomembranes. There were no cases of type I neomembranes.

Risk factors associated were hypertension seen in 9 out of 19 i.e. (47.38%) patients, and diabetes in 4 out of 19 i.e. (21.05%) patients, few cases were diagnosed to be denovo at the time of presentation. Risk factor of bleeding diathesis i.e. haemophilia A, was seen in one case. One case was a known case of chronic rheumatic heart disease on acitrom was taken up for surgery after correction of PT, APTT, INR.

Other factors observed are anemia and jaundice in two cases, hypothyroid in one and had seizures in one case. All the above factors are in contradiction to Bokka, et al. [4] which shows, diabetes mellitus and hypertension in 3.84% and 5.76% of cases respectively.

One of the most important associated risk factors seen was the history of chronic alcoholism combined with smoking 10/19 i.e. 52.6% and only alcoholics were 2/19 i.e. 10.52% mostly because the population was from rural areas, illiteracy, and underdiagnosed as to be other medical ailment and treated by quacks with improper care. Different surgical procedures have been applied in the management. Although there is no standard accepted surgical procedure the common concepts range from burr holes or twist drill hole to craniotomy with membranectomy.

As far the surgical management was concerned all were subjected to as tandard craniotomy with a trauma flap diameter of the bone flap increased as involved area increased, accordingly all cases were subjected to craniotomy, membranectomy followed by histopathological examination later. 2 cases were subjected for re-operation due to recollection, one was having haemophilia A, presenting with defective vision in the POD.

One case was reoperated after confirmation with CT as his GCS was deteriorating on the 15th POD. Later was discharged on 7th POD following resurgery with GCS 15. Glasgow coma scale was used for measuring outcome and considerably among the 19 cases 15 did well postoperative Glasgow coma scale was 15/15 at discharge, 4 cases expired during the postoperative period. One case with hemophilia A which was first thought for conservative line of management had to be operated due to the progressive head ache which was worsening day by day and later patient had complains of defective vision was reoperated for recollection and expired later during the course of stay. One case with GCS 10 at the time of presentation diagnosed to have chronic SDH associated with chronic lacunar infarcts in the right thalamus, expired on 3rd POD as his general condition since the time of admission was poor.

One case with hypertension bilateral SDH with acute component on one side, GCS at the time of presentation was 8 expired on the 5th POD. One case with history of trauma, hypertensive diagnosed to have chronic SDH in right fronto-parietal region with midline shift of <0.5cms expired on 4th POD. As far as recurrence is concerned Potdar, et al. [5] recurrence rates were 5%, which is in contradiction to our study showing about 15%.

Mortality in our series showed about 21%. Morbidity was minimal. Mortality is more may be because of increasing age, risk factors and associated risk factors, poor general condition, cardiac and pulmonary issues. Three cases with GCS < 8 were operated, 2 cases had good

outcome and 1 had poor outcome. Among four cases with GCS 9-12, 3 had good outcome, 1 was poor.

Among twelve cases with GCS 13-15 at presentation 10 had good outcome, 2 had poor outcome the general condition since the time of admission was poor. Using only GCS as prognostic indicator is one of the major limitation of the present study.

Craniotomy, membranectomy and craniectomy should be reserved for those instances in which the subdural collection reaccumulates, the brain fails to expand, or there is solid hematoma [12].

Conclusion

Male preponderance in all age groups, older age group 60 to 70 years are more prone for this condition. Most common symptomatology noted was as hemiparesis at presentation following headache and altered sensorium. Craniotomy and membranectomy is an more appropriate way of management in cases presenting with subdural membranes and also cases presenting with recurrence, provided the general condition of the patient permits. The role of histopathology in diagnosing is inevitable as some rarer entities may also be detected, like calcifications, metastasis, infections, etc. When in doubt it is better to go with contrast enhanced imaging since they may point out any loculations, MRI being more effective. History of trauma may or may not be a triggering factor in the history of such cases. Use of anti-platelets, anticoagulants, history of CAD, CVA, malignancy, rheumatic disorders, etc. diabetes, hypertension, alcoholism, smoking are important points to be noted in the history. Membrane study acts as a rough guide to estimate the time since injury. Mortality rate was about 20% in the present study. Overall prognosis of the patients remains good unless and until compensated by overlying pathological entity. This study underlines that craniotomy and subtotal membranectomy is still an acceptable, safe, efficient and even a better

procedure for patients presenting with subdural membranes.

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